HYDRO-ELECTRIC POWER

FROM A

HOPPES HYDRO-ELECTRIC UNIT

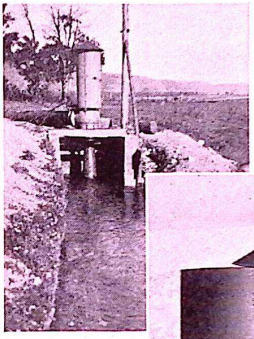


Fig. 1

A LOW COST SOURCE OF ELECTRICITY FOR FARMS, ESTATES, RANCHES, RESORTS, CLUBS, CAMPS, SMALL MANUFACTURING PLANTS, RURAL ELECTRIFICATION AND MANY OTHER USES.

BULLETIN H-49

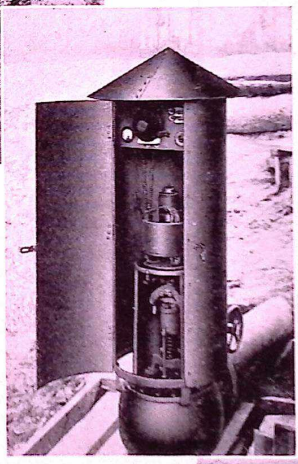


Fig. 2

Fig. 3

MANUFACTURED BY

THE JAMES LEFFEL & COMPANY

SPRINGFIELD, OHIO, U. S. A.

Established 1862

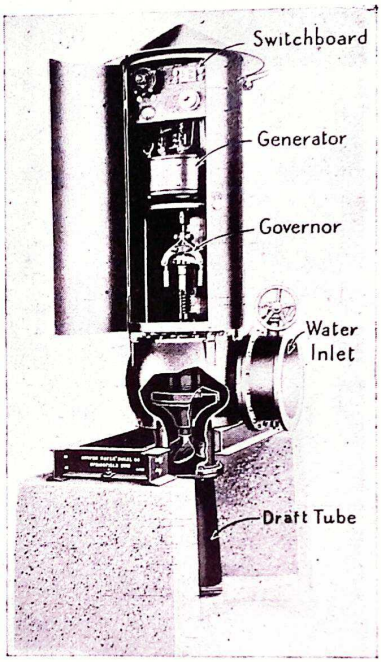


Fig. 4

Cutaway Section Showing Governor Control Valve.

The Hoppes Hydro-Electric Unit has been specially designed to provide an economical source of electricity and power for people in locations where otherwise it would not be possible to enjoy it. This unit will give continuous service. It will operate without noise and require no further service than for a small amount of lubrication.

This unit being of the efficient vertical design permits the generator and electrical equipment to be carried above flood water. This unit is direct connected. Troublesome and power absorbing gears and belts are eliminated.

The instrument board is equipped with voltmeter, switch, fused cutout, rheostat, and porcelain bushings to protect the wiring. The generator, instruments and governor are protected from the weather by a steel housing and the compact unit is furnished with an I beam foundation frame. A worm gear operated butterfly valve at the inlet permits shutting down the unit when desired. A tapered steel draft tube is furnished.

The turbine governor is mounted on the power shaft and regulates the speed of the unit. The interior view of the unit, Fig. 4, shows the stream line water passage, free from gates, links and other obstructions, which might cause it to clog with leaves and interfere with the water flow.

Fig. 5
1 K. W. Unit on a Ranch in Montana.

The generator is specially designed for use on this unit. The windings are carefully treated to protect them from moisture. The rotor shaft is mounted on ball bearings. This sturdy unit offers the high grade of performance necessary for the sensitive electrical appliances, household and otherwise now available. These units can be furnished for either direct or alternating current.

Hoppes Units have been in continuous operation for over fifteen years and have world-wide distribution. They produce electric current at its lowest cost and make use of water in streams, which might otherwise be wasted. In most cases a small dam is required and a pond thus created for power purposes can often be used also for watering stock, fire protection, recreation and many other purposes.

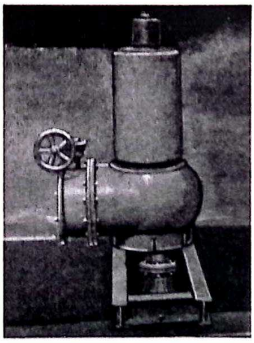


Fig. 6
Turbine With Governor Used for Driving Machinery.

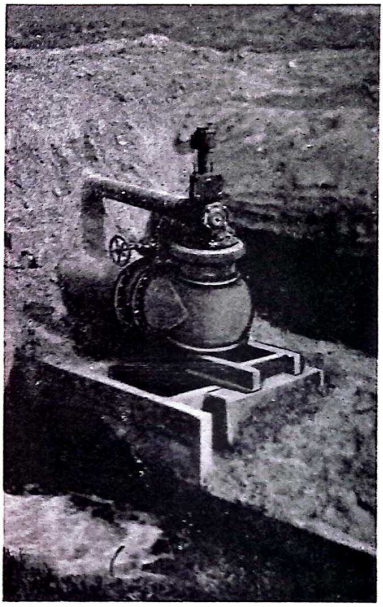


Fig. 7
Turbine Direct Connected to Centrifugal Pump.

The direct current plant is available with or without governor depending on the particular requirements of the individual installation. With or without a governor the design is such as to control the unit within sufficiently close limits.

The Hoppes Hydro-Electric Unit is used primarily for generating electricity. However, the turbine may also be used for other purposes, such as driving pumps for irrigation as in Fig. 7, or operating other machinery as indicated in Fig. 6.

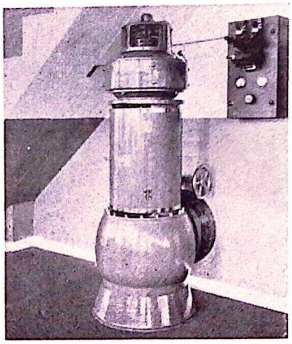


Fig. 8—5 K. W. Indoor Style in manufacturing plant in Michigan.

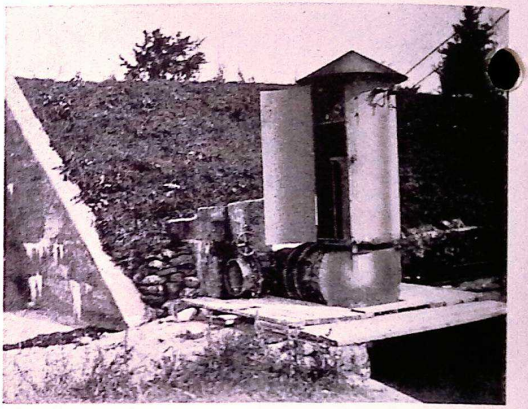


Fig. 11—5 K. W. Unit on an estate in New York.

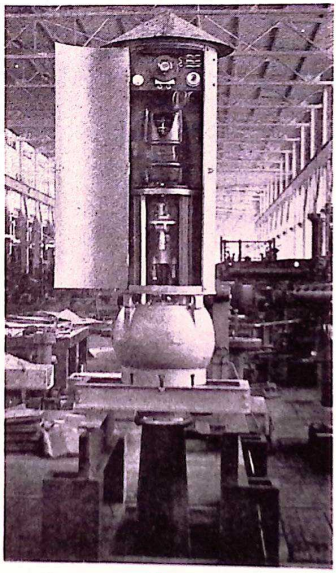


Fig. 9
2½ K. W. Unit on factory erection floor.

Fig. 10—5 K. W. Unit on a ranch in Montana.

These Pictures show some of the many installations of the Hoppes Hydro-Electric Units. Here is what some of our customers say about these units.

From an Estate owner in New York.

"After operating a Hoppes Hydro-Electric Unit for five years we find it very satisfactory. It has been used continuously during that time and operates as well in winter as in summer. It has cost us on an average of one dollar per year."

From an Agricultural College Professor in Oregon.

"I am glad to report that the Hoppes plant I bought some six years ago is giving me excellent service. It has been in practically continuous service thruout this period."

From a Lawyer in North Carolina.

"It gives me great pleasure to advise you that my Hoppes Hydro-Electric plant has been entirely satisfactory and its cost of operation trifling. I would not hesitate to recommend the plant to any one desiring to install an electric plant."

From Supt. of a Municipal Water Works Plant in Colorado.

"This plant has given good service and has been in continuous operation. It operates as satisfactory in winter as in

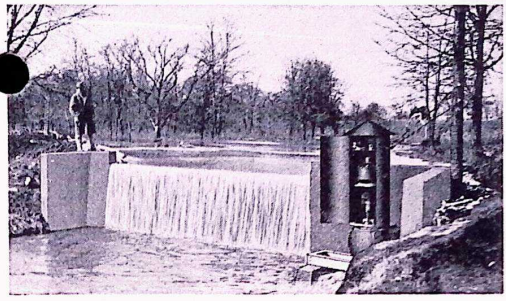


Fig. 12—1 K. W. Unit on a farm in Ohio.

Fig. 13—5 K. W. Unit on a farm in Colorado.

summer. It gives good voltage regulation and the total cost of operation has been for a little grease and oil together with a few brushes."

From a Miller in Tennessee.

"Out plant has been in continuous operation since we put it in seven years ago. It has given almost perfect service so we would recommend it highly."

From a Farmer in Michigan.

"We have operated our plant since 1927 and aside from what it saves in light bills we get lots of enjoyment out of the pond; we have fish in the summer and skating in the winter."

From a Fish Hatchery in Texas.

"Our 3 K. W. plant has been in continuous operation since 1931 and furnishes light and power for 3 houses, radios, fans, mixers, refrigerators, water pump and other appliances. The performance of this plant has been very satisfactory and a very good investment."

From a Rancher in Montana.

"Our plant was installed in 1926 and has given us good service. It operates day and night."

From a Miller in Michigan.

"The Hoppes installation has given us good service going on ten years now, think $5.00 would cover all expense and would recommend the unit to any one having the water to operate it."

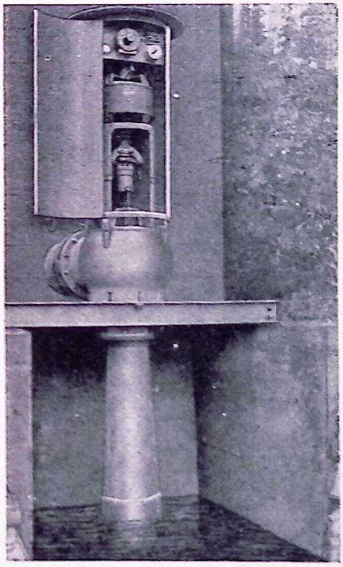


Fig. 14—5 K. W. Unit on a Dude Ranch in Montana.

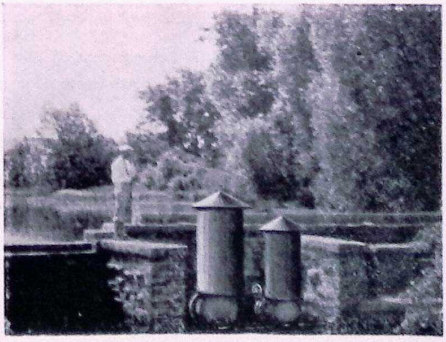


Fig. 15—5 K. W. and 1 K. W. Units on an estate in Wisconsin.

Rating Tables of Hoppes Hydro-Electric Units

ELECTRICAL CAPACITY	Head in Feet	Style	Water in Cubic Feet Per Minute
½ KILOWATT OR 500 WATTS	* 8	HL	104
	* 9	HJ	92
	* 10	HJ	82
	* 11	F	74
	* 12	F	68
1 KILOWATT OR 1000 WATTS	* 8	IL	190
	* 9	HL	175
	* 10	HL	155
	11	HL	140
	12	HJ	127
	13	HJ	118
	14	HJ	110
	15	HJ	105
	16	HJ	100
	17	HJ	94
	18	HJ	90
	19	F	84
	20	F	80
	21	F	76
	22	F	74
	23	F	72
	24	F	70
	25	F	68
2 KILOWATTS OR 2000 WATTS	* 8	JP	330
	* 9	JP	290
	* 10	JP	260
	* 11	HL	245
	* 12	HL	225
	* 13	HL	215
	14	HL	190
	15	HL	178
	16	HL	166
	17	HL	156
	18	HJ	153
	19	HJ	148
	20	HJ	140
	21	HJ	133
	22	HJ	127
	23	HJ	120
	24	F	116
	25	F	110
3 KILOWATTS OR 3000 WATTS	8	LR	470
	9	JP	415
	10	JP	370
	11	JP	340
	12	JP	310
	13	JP	280
	14	JP	260
	15	IL	250
	16	IL	240
	17	HL	225
	18	HL	210
	19	HL	200
	20	HL	190
	21	HL	180
	22	HL	170
	23	HL	165
	24	HJ	162
	25	HJ	158
5 KILOWATTS OR 5000 WATTS	8	OT	760
	9	OT	600
	10	LR	590
	11	LR	535
	12	LR	490
	13	JP	470
	14	JP	435
	15	JP	400
	16	JP	365
	17	JP	340
	18	JP	330
	19	JP	320
	20	JP	315
	21	HL	300
	22	HL	290
	23	HL	285
	24	HL	275
	25	HL	260
7½ KILOWATTS OR 7500 WATTS	11	OT	800
	12	OT	740
	13	LR	680
	14	LR	630
	15	LR	590
	16	JP	550
	17	JP	515
	18	JP	490
	19	JP	480
	20	JP	450
	21	JP	430
	22	JP	410
	23	JP	400
	24	JP	390
	25	JP	380
10 KILOWATTS OR 10000 WATTS	12	OT	980
	13	OT	900
	14	OT	840
	15	OT	780
	16	LR	715
	17	LR	670
	18	LR	650
	19	JP	610
	20	JP	580
	21	JP	550
	22	JP	525
	23	JP	500
	24	JP	490
	25	JP	480

Head in feet referred to above is illustrated on page 7, Fig. 16.

Style refers to various sizes of Hoppes Hydro-Electric Units. See dimensions on page 7.

Quantity of water the unit will use at full rated capacity is listed above in cubic feet per minute.

*Units marked with * furnished in direct current only.

Standard rating for alternating current units is 3 phase 60 cycle and either 120 or 240 or 480 volts. These Hoppes Hydro-Electric Units may also be furnished for 50 cycle current.

When you write us, please give full particulars on your electrical requirements.

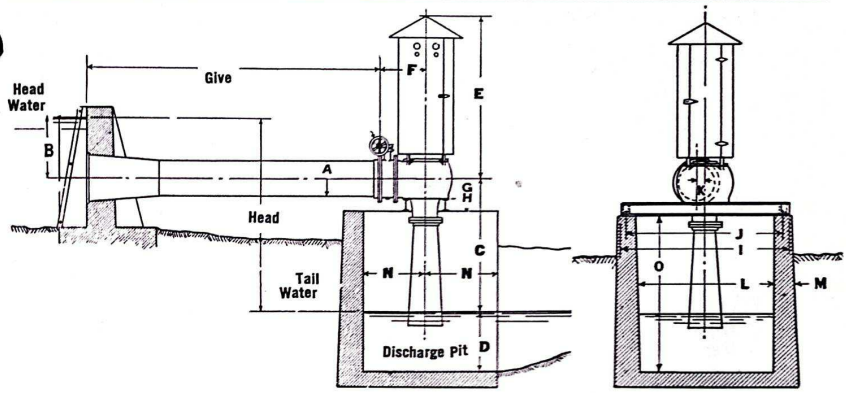


Fig. 16

Dimensions of various sizes of Hoppes Hydro-Electric Units are indicated in the above diagram and listed in the chart. Minimum distance from head water level to center of inlet pipe is given. Diameter of inlet pipe to connect with the unit is given. This inlet pipe should be short as possible.

In addition to the examples of complete Hoppes Hydro-Electric Units illustrated and specified herein, many other styles of turbines may be furnished, see page 11. Our Engineering Department will gladly assist and advise you regarding any details relating to the installation of Hoppes Hydro-Electric Units or Leffel turbines. For over three quarters of a century we have specialized in the designing and constructing of hydraulic turbines of all kinds. With this background of experience we are prepared to furnish designs to meet your requirements.

GENERAL DIMENSIONS
Style Sizes

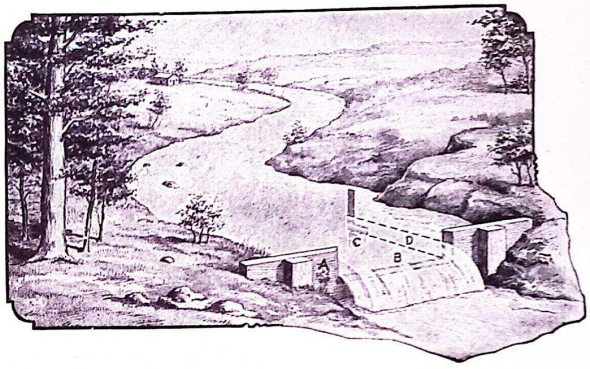
	F	HJ	HL IL	JP	LR	OT
A	6"	10"	12"	16"	18"	20"
B	18"	24"	24"	36"	36"	36"
C	60"	60"	60"	60"	60"	60"
D	24"	30"	30"	36"	42"	48"
E	58"	72"	72"	88"	90"	90"
F	20½"	18"	18"	22"	23"	27"
G	5⅛"	8⅜"	9⅜"	11⅜"	11⅞"	14¼"
H	5"	5"	5"	6"	6"	7"
I	72"	72"	72"	84"	84"	96"
J	66"	66"	66"	78"	78"	90"
K	3⅛"	4¾"	4"	4"	4"	4½"
L	60"	60"	60"	72"	72"	84"
M	8"	8"	8"	9"	10"	10"
N	30"	30"	30"	36"	42"	48"
O	73½"	73⅜"	75⅜"	78⅞"	84⅛"	86¾"

IMPORTANT—Please Note:

In order that you may realize the most from this service, please give us all possible information concerning the hydraulic features of your power site using INFORMATION SHEET on page 9 as a guide.

HEAD OF WATER: This is the vertical distance (in feet) from head water surface down to tail water surface. The term "head" is graphically illustrated on Fig. 16 (above).

QUANTITY OF WATER AVAILABLE: See page 8 for illustrations for measuring the flow of streams. If possible give minimum and average stream flow in terms of cubic feet per minute.



INSTRUCTIONS FOR MEASURING QUANTITY OF WATER

First, select a suitable location in the stream where the water flows smoothly and place a board construction "A" across the stream to form a weir dam. This board should have a width of notch "B" in it about six times the greatest depth of water flowing over the weir. The notch should be beveled on the down stream side to almost a sharp edge, with the bottom of the notch not less than six inches above the water on the down stream side.

Drive a stake "C" about three feet up stream from the weir, to a depth that the top of the stake will be exactly level with the bottom of notch "B". When all the water is flowing over the weir measure the depth "D" over the top of the stake, then read the table which gives the cubic feet per minute for each inch in width of notch "B". Multiply the number just found by the inches of notch width which will give the flow in cubic feet per minute.

On larger streams select site as above. Measure the average water depth between edges. Also measure average width. Floats consisting of short wooden strips weighted so as to be submerged two-thirds of their height should then be placed in the stream so as to measure the average distance carried in a minute. All measurements to be in feet and at the same relative location. The product of depth, width, distance and the constant .8 will give the approximate flow in cubic feet per minute.

TABLE SHOWING THE QUANTITY OF WATER PASSING OVER WEIR IN CUBIC FEET PER MINUTE FOR EACH INCH IN WIDTH FOR NOTCH B

INCHES DEPTH OVER STAKE D		1/8 Inch	1/4 Inch	3/8 Inch	1/2 Inch	5/8 Inch	3/4 Inch	7/8 Inch
1 Inch	.40	.47	.55	.65	.74	.83	.93	1.03
2 "	1.14	1.24	1.36	1.47	1.59	1.71	1.83	1.96
3 "	2.09	2.23	2.36	2.50	2.63	2.78	2.92	3.07
4 "	3.22	3.37	3.52	3.68	3.83	3.99	4.16	4.32
5 "	4.50	4.67	4.84	5.01	5.18	5.36	5.54	5.72
6 "	5.90	6.09	6.28	6.47	6.65	6.85	7.05	7.25
7 "	7.44	7.64	7.84	8.05	8.25	8.45	8.66	8.86
8 "	9.10	9.31	9.52	9.74	9.96	10.18	10.40	10.62
9 "	10.86	11.08	11.31	11.54	11.77	12.00	12.23	12.47
10 "	12.71	12.95	13.19	13.43	13.67	13.91	14.16	14.42
11 "	14.67	14.92	15.18	15.43	15.67	15.96	16.20	16.46
12 "	16.73	16.99	17.26	17.52	17.78	18.05	18.32	18.58
13 "	18.87	19.14	19.42	19.69	19.97	20.24	20.52	20.80
14 "	21.09	21.37	21.65	21.94	22.22	22.51	22.70	23.08
15 "	23.38	23.67	23.97	24.26	24.56	24.86	25.16	25.46
16 "	25.76	26.06	26.36	26.66	26.97	27.27	27.58	27.89
17 "	28.20	28.51	28.82	29.14	29.45	29.76	30.08	30.39
18 "	30.70	31.02	31.34	31.66	31.98	32.31	32.63	32.96
19 "	33.29	33.61	33.94	34.27	34.60	34.94	35.27	35.60
20 "	35.94	36.27	36.60	36.94	37.28	37.62	37.96	38.31
21 "	38.65	39.00	39.34	39.69	40.04	40.39	40.73	41.09
22 "	41.43	41.78	42.13	42.49	42.84	43.20	43.56	43.92
23 "	44.28	44.64	45.00	45.38	45.71	46.08	46.43	46.81
24 "	47.18	47.55	47.91	48.28	48.65	49.02	49.39	49.76

INFORMATION SHEET

Refer to page 7 describing term "head" Refer to page 8 for methods to measure quantity of water in cubic feet per minute.

Make a sketch on rear side of this sheet showing arrangement of your power site and indicate how you believe a unit can be installed.

Please fill in accurately all information requested, tear sheet out of bulletin and return for our recommendations and quotation.

THE JAMES LEFFEL & COMPANY,
SPRINGFIELD, OHIO, U. S. A.

TEAR OFF HERE

What head can be developed?.....feet

Average Stream Flow (cubic feet per minute).....Minimum Flow.....Maximum Flow.....

What pondage will be formed above the dam?.....Acres

How high does tail water raise during floods?.....feet

Is the Site developed at present?.....

Give distance from dam to where plant will be installed.....feet

Give distance from plant to point of power use.....feet

What kilowatt capacity is desired?..... Alternating current..... or Direct current.....

Volts.....Phase (If A. C.).....Cycle (If A. C.).....

Are

What

NAME..... Date.....

Street No. or R. F. D..... County.....

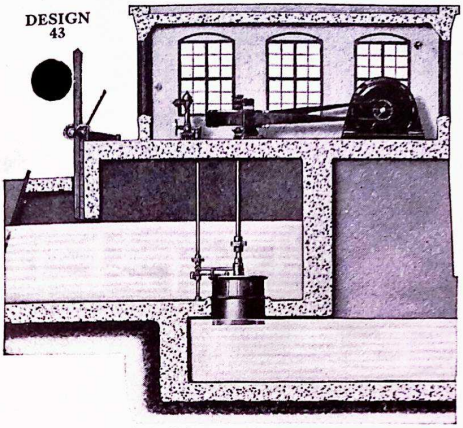
City..... State.....

MAKE A SKETCH OF POWER SITE
Showing How You Believe Installation Can Be Made

TEAR OFF HERE

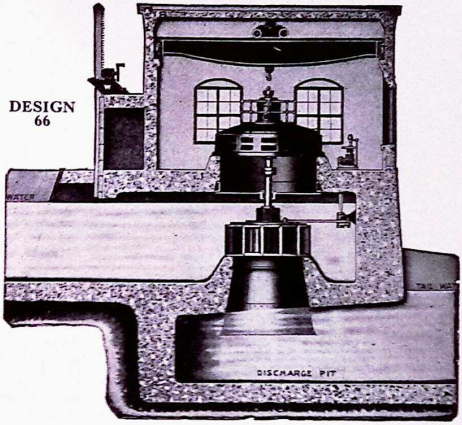
THE VIEWS BELOW ILLUSTRATE A FEW OF THE MANY OTHER DESIGNS OF TURBINES WE MANUFACTURE—SEND FOR FULL PARTICULARS.

DESIGN 43

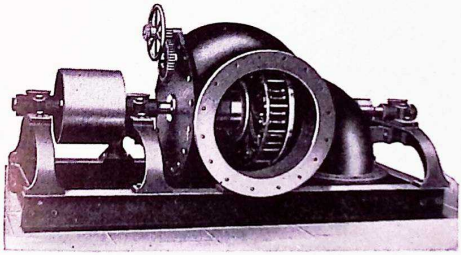


We also furnish Leffel vertical turbines equipped with vertical shafting and pulley with quarter twist belt and tightener driving generator.

DESIGN 66

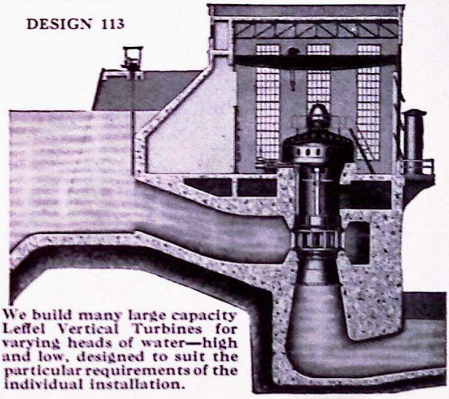


We design and furnish Leffel vertical turbines developing high speeds, high powers, high efficiencies, for direct connecting to generators.

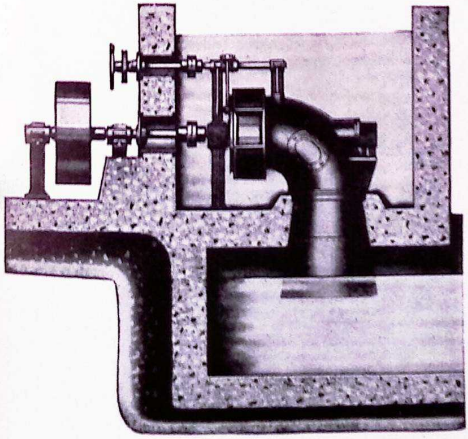


DESIGN 7. Single Discharge Leffel Horizontal Turbine Set, [illegible]tained, specially desirable for small powers installed under high heads, belt or direct connection drive.

DESIGN 113

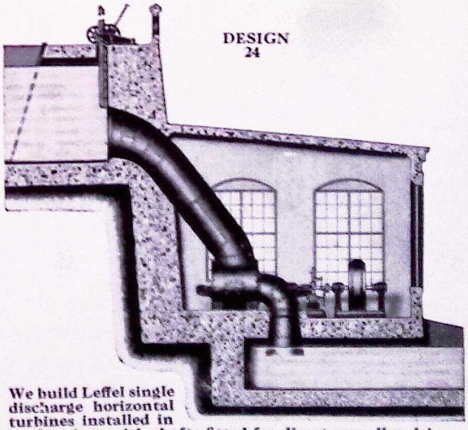


We build many large capacity Leffel Vertical Turbines for varying heads of water—high and low, designed to suit the particular requirements of the individual installation.



DESIGN 25. Leffel Single Discharge Horizontal Turbine for installment in open penstock under low and medium heads. Plans and prices quoted upon request. This makes very simple installation.

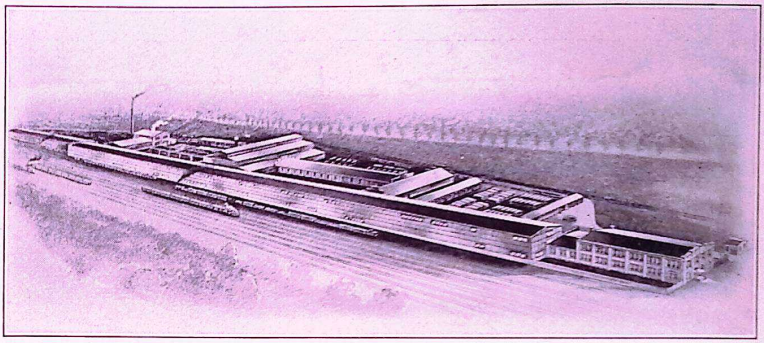
DESIGN 24



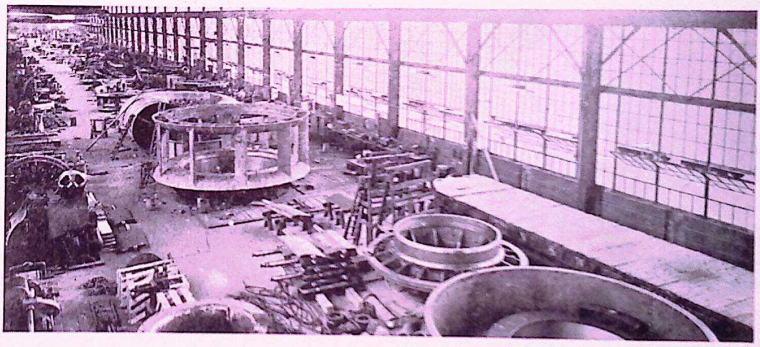
We build Leffel single discharge horizontal turbines installed in steel casings with shafts fitted for direct or pulley drive. Oil thrust bearings water cooled.

THE JAMES LEFFEL & CO.

ESTABLISHED 1862



MAIN OFFICE AND FACTORY



MACHINE AND ERECTING DEPARTMENT

SHOWING LEFFEL TURBINES IN PRODUCTION

Our factory is located on several principal railroads and is of latest industrial design thruout, equipped with special motor driven machinery for production of Leffel turbine water wheels and accessories. We give all orders our most prompt and careful attention.